

### IN THE CLAIMS

Please find below a listing of claims to replace all prior versions, and listings, of claims in the present patent application:

1. *(currently amended)* A multi-wavelength laser source comprising:
  - a) an input for receiving an energy signal;
  - b) a gain section in communication with said input, said gain section including a homogeneously broadened gain medium comprising rare-earth doped fiber having a superstructure grating, said superstructure grating comprising a first grating segment and a second grating segment superposed at least in part on said first grating segment to form a plurality of at least three cavities, each of said cavities occupying a portion of said doped fiber that is unoccupied by any other one of said cavities that are distributed in said homogeneously broadened gain medium such that, when the energy signal is applied to said gain section[[,]]:
    - different resonant laser wavelengths resonate in respective ones of said cavities that are separated from one another; and
    - said gain section generating generates a multi-wavelength laser signal when the energy signal is applied to the gain section exhibiting the laser wavelengths; and
  - c) an output for emitting the multi-wavelength laser signal.
2. *(original)* A multi-wavelength laser source as defined in claim 1, wherein the energy signal is generated by either one of a pump laser diode, a fiber laser pump, a solid state laser pump and a raman laser pumps.
3. *(original)* A multi-wavelength laser source as defined in claim 1, wherein the gain section further comprises an amplifying section.
4. *(cancelled)*
5. *(cancelled)*

6. *(cancelled)*
7. *(previously presented)* A multi-wavelength laser source as defined in claim 1, wherein the first grating segment is a chirped Bragg grating.
8. *(original)* A multi-wavelength laser source as defined in claim 7, wherein the second grating segment is a chirped Bragg grating.
9. *(previously presented)* A multi-wavelength laser source as defined in claim 1, wherein the first grating segment and the second grating segment are substantially similar to one another.
10. *(cancelled)*
11. *(cancelled)*
12. *(withdrawn)* A multi-wavelength laser source as defined in claim 1, wherein the superstructure grating includes an index grating structure.
13. *(withdrawn)* A multi-wavelength laser source as defined in claim 1, wherein the superstructure grating has a complex apodization shape in amplitude.
14. *(withdrawn)* A multi-wavelength laser source as defined in claim 13, wherein the superstructure grating has a complex apodization shape in phase.
15. *(cancelled)*
16. *(cancelled)*
17. *(cancelled)*
18. *(cancelled)*

19. *(cancelled)*

20. *(currently amended)* A multi-wavelength laser source as defined in claim [[19]] 1, wherein the doped fiber comprises a core and a cladding and the superstructure grating is located in the ~~waveguide~~ core.

21. *(currently amended)* A multi-wavelength laser source as defined in claim [[19]] 1, wherein the doped fiber comprises a core and a cladding and the superstructure grating is located in the ~~waveguide~~ cladding.

22. *(currently amended)* A method ~~suitable~~ for generating a multi-wavelength laser signal, said method comprising:

- a) receiving an energy signal;
- b) providing a gain section including a homogeneously broadened gain medium comprising rare-earth doped fiber having a superstructure grating, said superstructure grating comprising a first grating segment and a second grating segment superposed at least in part on said first grating segment to form ~~a plurality of at least three cavities that are distributed in said homogeneously broadened gain medium, each of said cavities occupying a portion of said doped fiber that is unoccupied by any other one of said cavities~~ such that, when the energy signal is applied to said gain section, different ~~resonant~~ laser wavelengths resonate in respective ones of said cavities ~~that are separated from one another~~; and
- c) applying the energy signal to said gain section to generate a multi-wavelength laser signal exhibiting the laser wavelengths.

23. *(cancelled)*

24. *(cancelled)*

25. *(cancelled)*

26. *(cancelled)*

27. *(cancelled)*

28. *(original)* An optical transmitter apparatus comprising the multi-wavelength laser source described in claim 1.

29. *(original)* A device suitable for providing optical components characterization comprising the multi-wavelength laser source described in claim 1.

30. *(original)* A device suitable for providing temporal spectroscopy functionality comprising the multi-wavelength laser source described in claim 1.

31. *(original)* A device suitable for providing material characterization for non-linear effects comprising the multi-wavelength laser source described in claim 1.

32. *(currently amended)* A multi-wavelength laser source comprising:

- a) a pump laser unit adapted for generating an energy signal;
- b) a gain section including a homogeneously broadened gain medium comprising rare-earth doped fiber having a superstructure grating, said superstructure grating comprising a first grating segment and a second grating segment superposed at least in part on said first grating segment to form ~~a plurality of~~ at least three cavities ~~that are distributed in said homogeneously broadened gain medium, each of said cavities occupying a portion of said doped fiber that is unoccupied by any other one of said cavities~~ such that, when the energy signal is applied to said gain section[[],]:
  - ~~different resonant laser~~ wavelengths resonate in respective ones of said cavities ~~that are separated from one another, the pump laser unit being adapted for applying the energy signal to; and~~
  - ~~said gain section to cause~~ generates a multi-wavelength laser signal ~~to be generated exhibiting the laser wavelengths; and~~
- c) an output for emitting the multi-wavelength laser signal.

33. *(original)* A multi-wavelength laser source as defined in claim 32, wherein the pump laser unit is positioned such as to generate the energy signal in a co-propagation relationship with the output.
34. *(original)* A multi-wavelength laser source as defined in claim 32, wherein the pump laser unit is positioned such as to generate the energy signal in a counter-propagation relationship with the output.
35. *(cancelled)*
36. *(cancelled)*
37. *(original)* A multi-wavelength laser source as defined in claim 32, wherein said gain section comprises an amplification section.
38. *(cancelled)*
39. *(currently amended)* A multi-wavelength laser source as defined in claim 1, wherein the multi-wavelength laser signal is ~~characterized by~~ exhibits at least 8 laser wavelengths.
40. *(currently amended)* A multi-wavelength laser source as defined in claim 39, wherein the multi-wavelength laser signal is ~~characterized by~~ exhibits at least 15 laser wavelengths.
41. *(cancelled)*
42. *(cancelled)*
43. *(cancelled)*
44. *(currently amended)* A method as defined in claim 22, wherein the multi-wavelength laser signal is ~~characterized by~~ exhibits at least 8 laser wavelengths.

45. *(currently amended)* A method as defined in claim 44, wherein the multi-wavelength laser signal is ~~characterized by~~ exhibits at least 15 laser wavelengths.

46. *(cancelled)*

47. *(cancelled)*

48. *(cancelled)*

49. *(currently amended)* A multi-wavelength laser source as defined in claim 32, wherein the multi-wavelength laser signal is ~~characterized by~~ exhibits at least 8 laser wavelengths.

50. *(currently amended)* A multi-wavelength laser source as defined in claim 49, wherein the multi-wavelength laser signal is ~~characterized by~~ exhibits at least 15 laser wavelengths.

51. *(cancelled)*

52. *(cancelled)*

53. *(cancelled)*.

54. *(cancelled)*.

55. *(cancelled)*

56. *(cancelled)*

57. *(cancelled)*

58. *(previously presented)* A multi-wavelength laser source as defined in claim 1, wherein said homogeneously broadened gain medium has a length, the multi-wavelength laser signal is characterized by a number of laser wavelengths, and a ratio of the number of

laser wavelengths to the length of said gain medium is at least 1.0 laser wavelength per cm of length of said gain medium.

59. *(cancelled)*

60. *(cancelled)*

61. *(previously presented)* A method as defined in claim 22, wherein the homogeneously broadened gain medium has a length, the multi-wavelength laser signal is characterized by a number of laser wavelengths, and a ratio of the number of laser wavelengths to the length of the gain medium is at least 1.0 laser wavelength per cm of length of the gain medium.

62. *(cancelled)*

63. *(cancelled)*

64. *(previously presented)* A multi-wavelength laser source as defined in claim 32, wherein said homogeneously broadened gain medium has a length, the multi-wavelength laser signal is characterized by a number of laser wavelengths, and a ratio of the number of laser wavelengths to the length of said gain medium is at least 1.0 laser wavelength per cm of the length of said gain medium.

65. *(new)* A multi-wavelength laser source as defined in claim 1, said at least three cavities comprising at least eight cavities.

66. *(new)* A multi-wavelength laser source as defined in claim 1, wherein each of said cavities occupies a portion of said doped fiber that is also occupied by another one of said cavities.

67. *(new)* A multi-wavelength laser source as defined in claim 1, wherein the first grating segment and the second grating segment define respective refractive index modulations

that are shifted relative to one another along the doped fiber by a longitudinal shift, each of the first grating segment and the second grating segment being longer than the longitudinal shift.

68. *(new)* A multi-wavelength laser source as defined in claim 67, wherein each of the first grating segment and the second grating segment is at least 10 times longer than the longitudinal shift.

69. *(new)* A multi-wavelength laser source as defined in claim 68, wherein each of the first grating segment and the second grating segment is at least 20 times longer than the longitudinal shift.

70. *(new)* A multi-wavelength laser source as defined in claim 1, wherein the first grating segment has a length and a ratio of the number of laser wavelengths exhibited by the multi-wavelength laser signal to the length of the first grating is at least 3.6 laser wavelengths per cm.

71. *(new)* A multi-wavelength laser source as defined in claim 1, wherein the multi-wavelength laser source has a length less than 20 cm.

72. *(new)* A method as defined in claim 22, said at least three cavities comprising at least eight cavities.

73. *(new)* A method as defined in claim 22, wherein each of said cavities occupies a portion of said doped fiber that is also occupied by another one of said cavities.

74. *(new)* A method as defined in claim 22, wherein the first grating segment and the second grating segment define respective refractive index modulations that are shifted relative to one another along the doped fiber by a longitudinal shift, each of the first grating segment and the second grating segment being longer than the longitudinal shift.



75. *(new)* A method as defined in claim 74, wherein each of the first grating segment and the second grating segment is at least 10 times longer than the longitudinal shift.
76. *(new)* A method as defined in claim 75, wherein each of the first grating segment and the second grating segment is at least 20 times longer than the longitudinal shift.
77. *(new)* A method as defined in claim 22, wherein the first grating segment has a length and a ratio of the number of laser wavelengths exhibited by the multi-wavelength laser signal to the length of the first grating is at least 3.6 laser wavelengths per cm.
78. *(new)* A method as defined in claim 22, wherein the multi-wavelength laser source has a length less than 20 cm.
79. *(new)* A multi-wavelength laser source comprising:
- a) an input for receiving an energy signal;
  - b) a gain section in communication with said input, said gain section including a homogeneously broadened gain medium comprising rare-earth doped fiber having a superstructure grating, said superstructure grating forming at least three cavities, each of said cavities occupying a portion of said doped fiber that is unoccupied by any other one of said cavities such that, when the energy signal is applied to said gain section:
    - different laser wavelengths resonate in respective ones of said cavities; and
    - said gain section generates a multi-wavelength laser signal exhibiting the laser wavelengths; and
  - c) an output for emitting the multi-wavelength laser signal.
80. *(new)* A multi-wavelength laser source as defined in claim 79, said at least three cavities comprising at least eight cavities.
81. *(new)* A multi-wavelength laser source as defined in claim 79, wherein each of said cavities occupies a portion of said doped fiber that is also occupied by another one of said cavities.

82. *(new)* A multi-wavelength laser source as defined in claim 79, wherein said superstructure grating comprises at least two grating segments at least partially superposed on one another to form said cavities.
83. *(new)* A multi-wavelength laser source as defined in claim 82, wherein each of said grating segments is a chirped grating segment.
84. *(new)* A multi-wavelength laser source as defined in claim 82, wherein the grating segments define respective refractive index modulations that are shifted relative to one another along the doped fiber by a longitudinal shift, each of the grating segments being longer than the longitudinal shift.
85. *(new)* A multi-wavelength laser source as defined in claim 84, wherein each of the first grating segment and the second grating segment is at least 10 times longer than the longitudinal shift.
86. *(new)* A multi-wavelength laser source as defined in claim 85, wherein each of the first grating segment and the second grating segment is at least 20 times longer than the longitudinal shift.
87. *(new)* A multi-wavelength laser source as defined in claim 82, wherein a given one of the grating segments has a length and a ratio of the number of laser wavelengths exhibited by the multi-wavelength laser signal to the length of the given one of the grating segments is at least 3.6 laser wavelengths per cm.
88. *(new)* A multi-wavelength laser source as defined in claim 79, wherein the multi-wavelength laser source has a length less than 20 cm.
89. *(new)* A multi-wavelength laser source as defined in claim 79, wherein the multi-wavelength laser signal exhibits at least 8 laser wavelengths.

90. *(new)* A multi-wavelength laser source as defined in claim 89, wherein the multi-wavelength laser signal exhibits at least 15 laser wavelengths.